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Throughout 2017, the energy sector and state, local, tribal, and territorial (SLTT) governments were faced with several challenges affecting the energy sector in the form of several historic hurricanes, wind storms, and wildfires, all while dealing with the ever-present threat of cyber incidents. However the collective preparedness of local communities and industry partners ensured the sector was ready to respond and restore energy systems as swiftly and safely as possible.

Stemming from lessons learned during the Colonial Pipeline incidents and Hurricane Matthew in 2016, the U.S. Department of Energy (DOE) developed the Energy Waiver Library, a resource that assists government and industry decision makers when exploring regulatory relief options for energy emergency response. These decision makers actively used the Energy Waiver Library during the historic 2017 hurricane season to study what waivers might be appropriate, how they were used in the past, and the correct points of contact in the Federal Government to request these measures.

Aerial damage assessment of Puerto Rico shows downed power lines.

Similarly, as information-sharing tools become more holistic and reliable, they become more useful to state

and local responders. Throughout 2017, DOE made its Environment for Analysis of Geo-Located Energy Information (EAGLE-I) System available to state energy emergency assurance coordinators, and EAGLE-I is currently being used by 123 state officials in 37 states.

These new tools, plus a number of key educational and training events, also helped prepare the SLTT community. The Clear Path V Exercise, held in Houston in May 2017, simulated a major hurricane, similar to Hurricane Ike, causing impacts to Southeastern Texas. Subsequently, on August 25, Hurricane Harvey made landfall as a Category 4 hurricane with winds of 130 mph near Corpus Christi, Texas. Common themes explored in Clear Path V, such as credentialing, access, and fueling logistics in the face of shortages, were experienced during the real-world response to Harvey and resulted in a more efficient response from the public and private sectors. Other workshops and webinars explored how municipal utilities might better coordinate in a storm, the appropriate role of emergency management in a cyber incident affecting the energy sector, and how governors' offices might leverage executive orders to accelerate response.

Over the last year, SLTT governments and industry partners banded together to face these challenges and restore the energy sector as quickly and as safely as possible. Through their expertise and leadership, the sector was able to withstand much of what was thrown at it. This SLTT Energy Assurance 2017 Year in Review will explore the projects and events that shaped and will continue to influence the security and resilience of the Nation's energy system at large.

TABLE OF CONTENTS

| EXECUTIVE SUMMARY | |
|--|----|
| INTRODUCTION | 1 |
| KEY EVENTS IN 2017 | 2 |
| EAGLE-I State Rollout | 2 |
| Energy Assurance Planning Updates | 3 |
| Clear Path V | 3 |
| 2017 Atlantic Hurricane Season | 4 |
| NATIONAL ASSOCIATION ACCOMPLISHMENTS | 7 |
| American Public Power Association | 7 |
| National Association of Regulatory Utility Commissioners | 7 |
| National Association of State Energy Officials | 8 |
| National Conference of State Legislatures | 8 |
| National Emergency Management Association | 9 |
| National Governors Association | 9 |
| Guide for State Petroleum Shortage Response Planning | 11 |
| Energy Assurance Workshop | 11 |
| Clear Path VI | 11 |
| A LOOK AT 2018 | 11 |
| APPENDIX A: POINTS OF CONTACT | 12 |
| APPENDIX B: ACRONYMS | 13 |
| APPENDIX C: REFERENCES | 14 |



Many energy disruptions start at the local level. A large majority of these incidents go unreported in national media and do not meet thresholds that beget a Federal response. Whether faced with heating fuel shortages in the wintertime or power outages during the middle of summer, state, local, tribal, and territorial (SLTT) officials must work amongst themselves and with local energy companies to ensure their constituents' energy needs are met on a consistent basis. When impacts from these events increase in size and do receive national media attention, and the sector and SLTT governments respond effectively, then stakeholders realize the value of energy assurance efforts.

In 2017, the SLTT Energy Assurance Program engaged with 289 individuals within all 50 states, four territories, and the District of Columbia, as well as their industry counterparts. All of these individuals play an important role in the reliable flow of energy for the jurisdictions they serve.

The U.S. Department of Energy (DOE), through its SLTT Energy Assurance Program, supports these SLTT stakeholders by providing Federal resources and expertise to foster an environment conducive to preparing for and responding to energy disruptions.

Situational awareness and information sharing are a cornerstone of these efforts. In 2017, DOE opened one of its most effective tools, the Environment for Analysis of Geo-Located Energy Information (EAGLE-I) System, to state energy emergency assurance coordinators and state emergency operations centers (EOCs) to assist in situational awareness and restoration of the electricity sector.



Crews from DOE's Western Area Power Administration work to restore St. Thomas's electrical backbone.

Despite the community's successes, challenges arise constantly with their own nuances and intricacies. In 2017, SLTT governments experienced this in the form of historic hurricanes, wildfires, and wind storms. These incidents not only directly affect the areas they impact, but also create shockwaves throughout the rest of the country's energy supply and resources. Events like this are reminders that continuous planning, preparedness, and cultivation of inhouse expertise must remain consistent priorities for all who work to ensure adequate supplies of electricity and fuel are available to the communities they serve.

The SLTT Energy Assurance 2017 Year in Review highlights the actions taken by DOE, in partnership with several national associations, industry, and other SLTT stakeholders, that promote energy security at all levels of government and build the resilience of the Nation's energy sector.



KEY EVENTS IN 2017

Throughout 2017, the SLTT Energy Assurance Program supported the DOE Office of Electricity Delivery and Energy Reliability's (OE's) Infrastructure Security and Energy Restoration (ISER) Division's mission of assisting other organizations to prepare for and respond to energy emergencies and minimize the consequences of an emergency.

EAGLE-I State Rollout

On May 31, 2017, DOE granted access to the EAGLE-I portal to EOCs and energy emergency assurance coordinators (EEACs) in all 50 states and Washington, D.C. EAGLE-I is a restricted, interactive geographic information system with energy infrastructure information and near-real-time electric utility customer outage data. Access to the EAGLE-I national outage map has been a longstanding request of state partners since its creation. However, licensing agreements on previous versions of the platform proved that to be legally challenging. In December 2016, OE/ISER began a pilot program with the Federal Emergency Management Agency (FEMA) and ten states to test state access to EAGLE-I and provide feedback. Based on this pilot project and the feedback received, ISER has extended this service to EEACs and state EOCs to facilitate electric sector situational awareness and accelerate restoration throughout the Nation. Federal and state responders used EAGLE-I extensively by throughout 2017 to maintain situational awareness and respond to outages. Lessons learned from this year will feed the improvement process and improve the value of EAGLE-I to its state and Federal users.



In 2017, state energy officials and emergency managers were given access to EAGLE-I in order to enhance situational awareness during energy emergencies.

123 EEACs from 37 states and the District of Columbia have access to EAGLE-I

Energy Assurance Planning Updates

In partnership with the National Association of State Energy Officials (NASEO), DOE's SLTT Energy Assurance Program provides funding and technical assistance in order to help states develop holistic energy assurance plans. These plans are meant to guide state and local government efforts during energy disruptions and ensure the flow of energy is restored as quickly as possible. In 2017, 12 states updated their energy assurance plans with some form of DOE assistance. In addition, NASEO has provided high-level critiques and reviews to three states (Nevada, Pennsylvania, and Wisconsin) that are in the process of updating their plans.

Clear Path V

Clear Path V, the fifth installment of DOE's flagship exercise series, addressed the challenges that the energy sector would face during a hurricane. DOE modulated this exercise after Hurricane Ike, which impacted the Gulf Coast. Clear Path V occurred over two days in Houston, Texas, and brought together over 150 participants from Federal, state, and local government, as well as the electricity subsector, oil and natural gas subsectors, and the communications sector, to enhance collaboration and explore participants' ability to prepare for and respond to a major hurricane. Clear Path V sought to enhance coordination among industry, local, state, and Federal partners in addressing supply chain interdependencies within and between the energy sectors—oil, natural gas, and electricity-and the communications sector during hurricane response operations.

The exercise highlighted interdependencies between the industry sectors and identified where sectors can further coordination efforts to address similar issues. Participants' observations over the two-day exercise strengthened their all-hazards preparedness and response operations. Throughout the exercise, participants demonstrated knowledge of their individual roles and responsibilities and their ability to work with response partners from both government and industry to develop creative solutions to restore communications and energy infrastructure and services. The exercise also featured an exhibit area where DOE's national laboratories demonstrated tools for visualizing and modeling infrastructure damage and supporting situational analysis.



Over 70% of Clear Path V participants were non-Federal Government representatives.



Chief of the Texas Division of Emergency Management Nim Kidd (left) discusses the state's emergency management challenges with ISER Deputy Assistant Secretary Devon Streit.

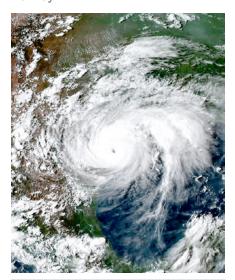
2017 Atlantic Hurricane Season

The 2017 Atlantic Hurricane Season was historic. Out of the 17 named storms, 3 major hurricanes—Harvey, Irma, and Maria—caused extreme damage to the United States. In their wakes, these storms left many without power, as highlighted in the table below.

| PEAK ELECTRICITY OUTAGES – 2017 HURRICANE SEASON | |
|--|-----------------------|
| Name of Storm | Peak Customer Outages |
| Harvey | 300,000 |
| Irma | 7.2 million |
| Maria | 1.6 million |

Source: U.S. Department of Energy

Harvey



Source: National Oceanic and Atmospheric Administration (NOAA)

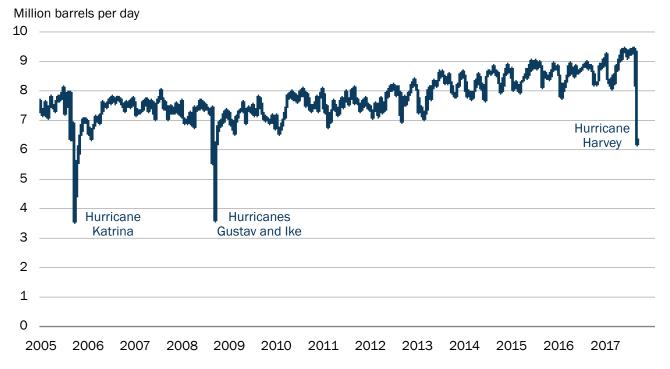
Hurricane Harvey, which made its first U.S. landfall on August 25, impacted southeastern Texas, including the Houston Metropolitan Area. Harvey was the first major hurricane to make U.S. landfall since Hurricane Wilma in 2005 and the first to directly impact Texas since Hurricane Ike in 2008. DOE supported restoration efforts by deploying 15 personnel to the National Response Coordination Center (NRCC), the Texas State EOC, the Texas Joint Field Office, and the Region VI Regional Response Coordinating Center (RRCC).

More than 300,000 customers experienced outages within the State of Texas during the storm. Approximately 10,000 linemen from around the country supported power restoration.

Hurricane Harvey's path also impacted the entire petroleum supply chain, including production of oil and gas in the Gulf of Mexico and Eagle Ford region, refineries along the Texas and Louisiana coasts, rail operations, and crude oil and natural gas pipelines and terminals.

During peak impact felt from the storm, offshore crude oil production in the Gulf of Mexico decreased nearly 25% from its pre-storm volumes of 1.75 million barrels/day (b/d). Natural gas production decreased nearly 26% from its pre-storm volumes of 3,220 MMcf/d (million cubic feet/day). Approximately 300,000–500,000 b/d of 870,000 b/d were shut in from the Eagle Ford region. At the peak on August 30, 20 refineries were shut down or in the process of restarting. More than 4.3 million b/d, or 21% of total U.S. refining capacity, were offline. In addition, many key refineries and injection points on the Colonial and Explorer pipelines, which transport products to the East Coast and the Midwest, were closed for over a week.

Weekly gross inputs to U.S. Gulf Coast refineries (Jan 2005 - Sep 2017)



Source: U.S. Energy Information Administration

Although Texas was the center of focus for much of DOE's response, these impacts to oil and gas products had more widespread effect on the rest of the United States. The SLTT Energy Assurance Program sent periodic updates to and convened situational update calls with state energy officials in the Midwest and along the East Coast to share information on fuel supplies with program stakeholders. This is just one of the many examples of the importance of communication networks during times of crisis.

Irma



Source: NOAA

Hurricane Irma, which impacted Puerto Rico and the U.S. Virgin Islands, caused a peak of nearly 7.2 million customer outages on the U.S. mainland.

Large portions of Puerto Rico and the U.S. Virgin Islands were also heavily impacted. DOE deployed a total of 36 personnel from DOE and the country to the NRCC, Florida EOC, Georgia EOC, Alabama EOC, Region IV RRCC in Atlanta, and FEMA Regional Offices in Puerto Rico, St. Thomas, and St. Croix.

Although damage was widespread, more than 60,000 workers from 250 utilities across the United States contributed to the swift restoration of power.

In addition to large-scale power outages, Irma also affected various portions of the oil and natural gas supply chain infrastructure. In Puerto Rico and the Virgin Islands, a shutdown of ports impacted 157,000 b/d in average fuel receipts. Liquefied natural gas facilities and pipelines were also shut. In the U.S. Southeast, port restrictions and closures

affected over 700,000 b/d in average fuel receipts. Key petroleum pipelines serving fuel to airports in Florida were also closed. In addition, several major interstate natural gas pipelines reported impacts from the hurricane. Florida experienced a loss of 2.2 billion cubic feet/day in natural gas supply. At peak impact, about 50% of all gas stations in Florida were out of service due to fuel shortages, lack of power, or both.

To address the curtailed fuel supplies stemming from Hurricane Harvey, DOE conducted regular calls with the oil and natural gas industry to address fuel supply and logistics issues. Because of consistent communications, DOE helped the industry publicly message the importance of calling 811 before digging to ensure that they safely avoided gas lines.

DOE also coordinated with U.S. Department of Defense and U.S. Department of Homeland Security officials to determine the effectiveness of waiving the Jones Act. On September 8, Acting Secretary of Homeland Security Elaine Duke signed the Jones Act Waiver. The signing of the waiver facilitated movement of petroleum products, such as gasoline, diesel, and jet fuel, from ports in the Gulf Coast and Mid-Atlantic to Florida, Georgia, South Carolina, North Carolina, Virginia, and Puerto Rico.

The U.S. Environmental Protection Agency consults DOE when the options of issuing fuel waivers are being weighted, including Reid vapor pressure and reformulated gasoline. DOE recently released guidance for requesting these waivers and their historical context in the Energy Waiver Library.

Maria



Source: NOAA

Hurricane Maria, the second Category 5 hurricane to impact Puerto Rico and the U.S. Virgin Islands in 2017, caused widespread damage to the Caribbean, causing nearly all customers of those territories to lose power.

Since Maria's passage in late September, DOE, alongside private and public partners such as the U.S. Army Corps of Engineers and FEMA, has been assisting the restoration and recovery of the territories.

DOE deployed 72 individuals under Emergency Support Function #12 to the impacted regions, NRCC, and the Region II RRCC. DOE's Western Area Power Administration sent 25 of their personnel and 10 line-trucks to the U.S. Virgin Islands to help replace poles and restring power lines on the islands.

As DOE and the rest of the Federal Government look to the longer-term recovery phase of the energy systems in the U.S. territories in the Caribbean, there will be a focus on a more resilient and technologically advanced electric grid.



The foundation of the SLTT Energy Assurance Program are the state energy offices, local utilities, public utility commissions, and emergency management offices and their representative professional associations. The SLTT Energy Assurance Program partners with these stakeholders through cooperative agreements. These agreements are used to collaborate with the network of resources available to the energy assurance community, including DOE national laboratories, energy sector owners and operators, and policy institutes.

American Public Power Association

Mutual Aid Playbook

DOE'S SLTT Energy Assurance Program provided funding and technical assistance for the American Public Power Association's (APPA's) updates to their *Mutual Aid Playbook*. The playbook is a useful guide that outlines how municipal electric utilities should coordinate with other government entities and how to request mutual aid from other utilities during times of disaster response and recovery. More information on mutual aid networks can be found on APPA's website.



Emergency Preparedness Tabletop Exercise

In October 2017, public power utility representatives participated in a tabletop exercise in New Orleans on the heels of recent responses to Harvey and Irma. The exercise's goal was to identify best practices and areas for improvement in APPA's *Mutual Aid Playbook*. Exercise play was centered on a Hurricane Katrina-like storm that makes landfall along the Gulf Coast. Events like this and participant feedback are vital to the effectiveness of products such as the *Mutual Aid Playbook*. Since its initial publication in 2014, the playbook has been updated several times based on input from APPA stakeholders.



National Association of Regulatory Utility Commissioners

Cybersecurity Primer

In January 2017, the National Association of Regulatory Utility Commissioners (NARUC) released the third edition of *Cybersecurity for State Regulators*. The primer is a vehicle for state commissions to engage utilities and highlight the investments utilities are making in cybersecurity preparedness.

Since its original release in 2012, NARUC's Research Lab has provided more than 60 training sessions on cybersecurity to state commissions across North America. In July of 2017, NARUC conducted a training at the New Mexico Public Regulation Commission in Santa Fe, New Mexico. A total of 46 participants, including state regulators and utility staff, attended the training. In the future, NARUC will develop online training sessions to support cybersecurity preparedness efforts. NARUC announced the initiation of the *Cybersecurity Manual*, which will serve as an implementation guide for the primer.

2017 Winter Committee Meetings

On February 12, ISER Deputy Assistant Secretary Devon Streit spoke at NARUC's Winter Committee Meeting in Washington, D.C. Streit discussed recent DOE activities to support cyber incident coordination with the Critical Infrastructure Committee. The Critical Infrastructure Committee also considered how best to provide cybersecurity training to utility commissions throughout the country, as well as how best to leverage new Federal Aviation Administration regulations on drones in support of damage and site assessments.



ISER is an active participant on NARUC's Critical Infrastructure Committee. In February, ISER Deputy Assistant Secretary Streit spoke about recent cyber incident coordination initiatives.



National Association of State Energy Officials

Annual Meeting in New Orleans

During September in New Orleans, Matt Duncan, Program Manager for OE/ISER's SLTT Energy Assurance Program, and Kate Marks, Office Director for State, Local, and Tribal Policy Analysis in DOE's Office of Policy, participated in a panel discussion,

"State Regional Energy Assurance and Resilience Planning and Coordination," at the NASEO Annual Meeting. Building upon the security posture and recent policy recommendations for improving state-level coordination, education, and exercising, DOE used this event to kick off its Regional Integrated Energy Security Planning initiative and solicited state input to inform what new tools, data, and planning constructs were needed to bolster state and local resilience and response, keeping in mind the threats and vulnerabilities the energy sector experiences. The feedback informed future work on regional integrated energy security challenges and led to the development of tools and methodologies to improve SLTT energy resilience planning. As a follow-up to this session, NASEO hosted a series of regional calls with states to further inform this work.

National Conference of State Legislatures

National Tribal Energy Summit

In early May, ISER Director of Preparedness and Exercises Puesh Kumar spoke at the National Tribal Energy Summit in Washington, D.C. The summit, which DOE hosted in coordination with the National Conference of State Legislatures (NCSL), brought tribal leaders together with government stakeholders and private industry representatives. With a focus on strengthening strategic partnerships, the summit supported tribal and Federal efforts to enhance energy security and resiliency. Mr. Kumar's presentation is available on the NCSL's website and will guide future energy assurance outreach with tribal communities.



Open Government Laws and Critical Energy Infrastructure

Due to the sensitive nature of sharing information on critical energy infrastructure, state legislatures are faced with the task of balancing transparency with security. Open Government Laws and Critical Energy Infrastructure, released in December of 2017, addresses these concerns and provides an interactive map that highlights state open government laws with exemptions for critical energy infrastructure. The NCSL resource also offers guidance for state legislatures that have not yet applied these critical energy infrastructure exemptions.



Source: Open Government Laws and Critical Infrastructure

National Emergency Management Association

Cyber Tabletop Exercise

NEMA The National Emergency Management Association conducted a tabletop exercise focused on a long-term power outage caused by a cyber incident. The exercise brought together state emergency managers and state officials in Nebraska, Illinois, and Maryland to test the exercise products and refine it for use with other states. The goal of the exercise module was to promote better integrated planning, coordination, response, and recovery between state emergency management, energy assurance offices, DOE, FEMA, and electrical utilities. Following the completion of the three pilots, the National Emergency Management Association made the exercise materials available publicly through their website document library under "Long Term Power Outage" within the "Resources" folder.

National Governors Association

Executive Orders Roadmap

The National Governors Association (NGA) collected and cataloged governors' executive orders from across the United States that focus on energy-related issues that arose during recent disasters. Following this, NGA developed a step-by-step roadmap that provides governors with recommendations on addressing energy



issues in the event of a disaster and identifying relevant policy options. The NGA Center based its roadmap on an experts' roundtable to identify the components and policy levers governors can use.

Roundtable on State Resiliency Assessment and Planning

On January 25, Pat Hoffman, then-Acting Assistant Secretary for OE, provided opening remarks at the NGA Experts Roundtable on State Resiliency Assessment and Planning in Washington, D.C. The event served as the kickoff of a year-long effort funded by OE's SLTT Energy Assurance Program, in partnership with NGA, to develop a State Resiliency Assessment and Planning Tool for states to evaluate their energy supply chains and other critical infrastructure assets, ultimately adding and accelerating response during disasters. Acting Assistant Secretary Hoffman discussed the importance of energy assurance planning and tools that DOE can provide states to support their efforts, as well as listening to state and industry perspectives on resilience. During the two-day event, state representatives heard from other states and cities that have developed and implemented their own resiliency assessment tools and provided feedback for NGA to incorporate into the tool. The group discussed case studies of communities that have used those tools to assess and improve their resiliency. Following each presentation, roundtable participants had the opportunity to ask questions and discuss how elements of the highlighted resiliency tools could be incorporated into state-level resiliency planning efforts and the NGA tool. The NGA will be piloting the State Resiliency Assessment and Planning Tool through retreats with three states (to be determined based on a competitive request for applications) in spring/summer 2018.



If 2017 was any indication, preparation and planning are as vital as ever before another natural disaster occurs. Threats are constantly evolving in the industry. With emerging technologies that are capable of improving overall resiliency, the sector has the opportunity to further reduce the likeliness of a major disruption, as well as the impacts of these incidents. The SLTT Energy Assurance Program will continue to encourage holistic energy assurance plans and convene workshops and exercises that examine our preparedness and response capabilities.

Guide for State Petroleum Shortage Response Planning

In the event of a shortage of petroleum supply, state energy officials have options available to assist the industry and the constituents they serve. NASEO is developing this resource, which is anticipated for release in summer 2018. It will serve as an update to 2012's *Petroleum Shortage Supply Management: Options for States*.

Energy Assurance Workshop

The OE/ISER is planning a workshop that will explore several energy security issues at the regional level. Participants from Federal, state, and local government, as well as the private sector, will be invited to attend. The Energy Assurance Workshop will be held in June 2018.

Clear Path VI

In 2018, Clear Path VI will be incorporated into the National Level Exercise, a congressionally mandated exercise series intended "to test and evaluate the capability of Federal, State, local, and tribal governments to detect, disrupt, and prevent threatened or actual catastrophic acts of terrorism, especially those involving weapons of mass destruction," and "to test and evaluate the readiness of Federal, State, local, and tribal governments to respond and recover in a coordinated and unified manner to catastrophic incidents" (6 U.S.C. § 748(b)(3)).

APPENDIX A: POINTS OF CONTACT

This report was prepared by the U.S. Department of Energy's Office of Electricity Delivery and Energy Reliability (OE) under the direction of Bruce Walker, Assistant Secretary, and Devon Streit, Deputy Assistant Secretary.

For questions about the State, Local, Tribal, and Territorial Energy Assurance Program, please contact Matthew Duncan (matthew.d.duncan@hq.doe.gov).

For general inquiries about OE's Infrastructure Security and Energy Restoration Division , please contact the Energy Response Center Inbox (EnergyResponseCenter@hq.doe.gov) or call 202-586-2264.

Matt Williams of BCS, Incorporated contributed to the development of this report.

APPENDIX B: ACRONYMS

APPA American Public Power Association

b/d Barrels/day

DOE U.S. Department of Energy

EAGLE-I Environment for Analysis of Geo-Located Energy Information

EEAC Energy Emergency Assurance Coordinator

EOC Emergency Operations Center

FEMA Federal Emergency Management Agency

ISER Infrastructure Security and Energy Restoration

NARUC National Association of Regulatory Utility Commissioners

NASEO National Association of State Energy Officials

NCSL National Conference of State Legislatures

NGA National Governors Association

NOAA National Oceanic and Atmospheric Administration

NRCC National Response Coordination Center

OE Office of Electricity Delivery and Energy Reliability

RRCC Regional Response Coordinating Center

SLTT State, Local, Tribal, and Territorial

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